# SECTION 03312
## CONCRETE FINISHING AND REPAIR OF SURFACE DEFECTS

## PART 1 - GENERAL

### 1.1 DESCRIPTION

A. Definitions:
   1. Floor finish tolerances shall be based on F-Number System defined within ASTM-E1155 as summarized below:
      a. Floor Flatness F-Number: Ff defines the maximum floor curvature allowed over 24 IN computed on the basis of successive 12 IN elevation differentials.
      b. Floor Levelness F-Number: Fl defines the relative conformity of the floor surface to a horizontal plane measured over a 10 FT distance.
      c. Above number pair shall always be stated in form: Ff/Fl.
      d. Specified overall valve is enumerated and is based on the composite of all measured valves in a placement.
      e. Minimum local valve (MLV) describes the flatness or levelness below which repair or replacement is required. MLV is based on an individual placement and applies to a minimum local area not crossing construction or control joints.

### 1.2 QUALITY ASSURANCE

A. Standards:
   1. ASTM-E1155: Standard Test Method for Determining Floor Flatness and Levelness - Using F-Number System.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Bonding agent: Approximately one (1) part Portland cement to one (1) part fine sand passing a No.30 mesh sieve. Mix to consistency of thick cream.

B. Patching compound: Same materials and approximately same proportions as used for concrete, except omit coarse aggregate. Shall consist of not more than one (1) part Portland cement to two and one half (2-1/2) parts sand loose volume. For exposed concrete, part of Portland cement shall be white to produce a color matching color of surrounding concrete, as determined by a trial patch. Add no more water than necessary for handling and placing. Mix compound in advance and allow to stand with frequent manipulation, without addition of water, until it has reached stiffest consistency that will permit placing.

C. Grout for grout cleaned rubbed finish: Mix one (1) part Portland cement and one and one-half (1-1/2) parts fine sand with sufficient water to produce a grout with a consistency of thick paint.

D. Grout for cork floated rubbed finish: Mix one (1) part Portland cement and one (1) part fine sand with sufficient water to produce a stiff grout.

E. Proprietary materials: At Contractor's option, proprietary compounds for adhesion, patching, or finishing may be used in lieu of or in addition to foregoing grouts. Use such compounds in accordance with manufacturer's recommendations.

## PART 3 - EXECUTION

### 3.1 FINISHING - GENERAL (EXCEPT TOP SURFACE OF SLABS)

A. After removal of forms, repair and give surfaces of concrete finishes indicated.

B. Unspecified finish: If finish is not designated, use following finishes as applicable:
   1. Unpainted concrete surfaces not exposed to public view: Rough form finish.
   2. Unpainted concrete surfaces exposed to public view: Smooth form finish.
   3. Concrete surfaces to receive paint: Grout cleaned rubbed finish.
   4. Unformed surfaces (except slabs): As indicated.
   5. Concrete surfaces to be waterproofed in Section 07120: Smooth form finish.

## 3.2 REPAIR OF SURFACE DEFECTS

A. Repair surface defects immediately after form removal. Remove honeycombed and other defective concrete down to sound concrete. Chip if necessary to make edges perpendicular to surface or slightly undercut. No feather edges will be permitted. Dampen area to be patched and an area at least 6 IN wide surrounding it to prevent absorption of water from patching compound. After surface water has evaporated from area to be patched, brush bonding agent into surface. When bonding agent begins to lose water sheen, apply patching compound. Thoroughly consolidate compound into place and strike off so as to leave patch slightly higher than surrounding surface. To permit initial shrinkage, leave undisturbed for at least 1 HR before final finish. Keep patched area damp for 7 days. Do not use metal tools in finishing a patch which will be exposed.

B. Tie holes: Unless stainless steel, non-corrosive, or acceptably coated ties are used, tie holes shall be filled. Clean and thoroughly dampen tie holes; fill solid with patching compound.

## 3.3 AS-CAST FINISHES

A. Rough form finish: No selected form facing materials are specified for rough form finish surfaces. Concrete surfaces must conform to tolerances in Section 03100 "Concrete Formwork". Patch defects and tie holes. Chip or ruboff fins exceeding 1/4 IN in height. Otherwise, leave surfaces with texture imparted by forms.

B. Smooth form finish: Use form facing material to produce a smooth, hard, uniform texture on concrete. It may be plastic coated plywood, metal, plastic liners, or other approved material capable of producing desired finish. Arrange facing material orderly and symmetrical, with number of seams kept to practical minimum. Support by studs or other backing capable of preventing excessive deflection. Do not use material with raised grain, patches, or other defects which will impair texture of concrete surface.
   1. Patch tie holes and defects. Remove fins completely.
   2. When surface texture is impaired and form joints misaligned by more than 1/8 IN grind bushhammer, or correct affected concrete as directed by the Government. Slurry grout areas evidencing minor mortar leakage to match adjacent concrete. Repair major mortar leakage as a defective area. When in opinion of the Government, workmanship is less than for approved trial panel for a smooth form finish, provide one of rubbed finishes selected by the Government at Contractor's expense.

C. Finishing of related unformed surfaces: (Except Slabs).
   1. Strike smooth tops of walls or buttresses, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces after concrete is placed.
   2. Float to a texture reasonably consistent with that of formed surfaces.
   3. Continue final treatment on formed surfaces uniformly across unformed surfaces.

## 3.4 RUBBED FINISHES

A. General: Form and repair concrete surfaces to receive rubbed finishes, in accordance with requirements for smooth form finish. Remove forms and perform necessary patching as soon after placement as possible without jeopardizing structure.

B. Smooth: Produce smooth rubbed finish on newly hardened concrete no later than day following form removal. Wet surfaces and rub with carborundum brick or other abrasive until uniform color and texture are produced. Use no cement grout other than cement paste drawn from concrete itself by rubbing process.

C. Grout cleaned: Undertake no cleaning operations until contiguous surfaces are completed and accessible. Wet surface of concrete sufficiently to prevent absorption of water from grout and apply grout uniformly. Immediately after applying grout, scrub surface vigorously with a cork float or stone to coat surface and fill air bubbles and holes. While grout is still plastic, remove excess grout by working surface with a rubber float, sack, or other means. After surface whitens from drying, rub vigorously with clean burlap. Keep finish damp for at least 36 hours after final rubbing.

D. Cork floated: Remove forms at an early stage, within 2 to 3 days of placement where possible. Remove ties. Remove burrs and fins. Dampen wall surface. Apply grout with firm rubber float or with trowel, filling surface voids. Compress grout into voids. If grout surface dries too rapidly to permit proper compaction and finishing, apply a small amount of water with a fog sprayer. Produce final texture with a cork float using a swirling motion.

## 3.5 SLAB FINISHING

A. General:
1. Place slabs to finish tolerances specified.
2. Slab finish: Use following finishes at building locations noted.
   a. Scratched finish: Surfaces intended to receive bonded applied cementitious applications, such as setting beds, grout, etc.
   b. Floated finish (magnesium):
      1) Surfaces intended to receive roofing, waterproofing membranes, or sand bed terrazzo.
      2) Surfaces of ramps, docks, stairs in which no other covering is specified.
   c. Troweled finish:
      1) Floors intended as walking surfaces or to receive floor coverings.

B. Finishing tolerances:
1. For shored construction, measurements for conformance with finishing tolerances shall be made as soon as slab can tolerate foot traffic, and before shores are removed.
2. The Fl levelness tolerance is not applicable to unshored form work such as cast in place topping on prestressed tees, slabs on unshored steel and metal deck, or unshored-postensioned slabs on steel beams.
3. Horizontal finishes will be accepted provided:
   a. Applicable specification requirements are satisfied.
   b. Water does not pond in areas sloped to drain.
   c. Floor finish tolerances Ff/Fl conforms to that specified for particular finish and minimum local valves are not less than 75 percent of the floor finish tolerance specified.
4. Accumulated deviation from intended true plane of finished surface does not exceed 1 IN.
5. Accuracy of floor finish does not adversely affect installation and operation of movable equipment, floor supported items or items fitted to floor (doors, tracks, etc.).

C. Finishes:
1. Scratched finish: After concrete has been placed, consolidated, struck off, and leveled to a Ff15/Fl13 tolerance, roughen surface with stiff brushes or rakes before final set.

2. Floated finish: After concrete has been placed, consolidated, struck off, and leveled, do not work further until ready for floating. Using a magnesium float, begin floating when water sheen has disappeared and surface has stiffened sufficiently to permit operation. During or after first floating, check planeness of entire surface with a 10 FT straightedge applied at not less than two different angles. Cut down high spots and fill low spots during this procedure to produce a surface within Ff20/Fl15 tolerance throughout. Refloat slab immediately to a uniform sandy texture.
3. Floated swirl finish: Use same procedure as for a floated finish except that final floating to produce swirl finish must begin when slab is wetter than for a normal trowel finish. Use a power troweling machine with a wood float attachment in a circular or swirling motion to produce a coarse texture with a swirl pattern.
4. Troweled finish: First float-finish surface. Next power trowel, and finally hand trowel. First troweling after power floating shall produce a smooth surface which is relatively free of defects but which may still indicate some trowel marks. Perform additional trowelings by hand after surface has hardened sufficiently. Final trowel when a ringing sound is produced as trowel is moved over surface. Thoroughly consolidate surface by hand troweling. Leave finished surface essentially free of trowel marks, uniform in texture and appearance and plane to a Ff25/Fl20 tolerance. On surfaces intended to receive floor coverings, grind off defects which would indicate through floor covering. On surfaces intended to receive waterproofing membranes grind off defects that might tear or otherwise damage membrane.
5. Broom or belt finish: Immediately after concrete has received float finish, give it a coarse scored texture by drawing a broom or burlap belt across surface transverse to slope or traffic flow.

## END OF SECTION